Suppose, now, that he is drifting towards B with a velocity equal to that of the wind, and travelling at right angles to AB with such a velocity that he can move along horizontally without falling towards the earth. Suddenly a gust overtakes him from the direction of A. He at once turns towards it, and his velocity relative to it is sufficient to raise him in the air. It tends to carry him more rapidly towards B; and when his velocity relative to it has sunk to the same value as before, and he again travels horizontally, he turns again at right angles to the line AB, but in the opposite direction to that which he had before. Presently the force of the gust diminishes, and the wind seems to blow towards him from the direction A. He accordingly turns towards it again, rising from the ground till his velocity relative to the air has assumed its former value, and he moves horizontally, turning again at right angles to the line AB, and the cycle is completed. He thus moves along in the direction AB with a mean velocity equal to that of the wind, rising when moving parallel to it, and moving horizontally, or perhaps slowly falling, if the gusts do not come with sufficient frequency, when moving at right angles to it.

In the case of all soaring birds, the spread tail, being an inclined curved surface, presents a large area to the wind. As it is situated at a considerable distance from the bird's centre of gravity, it must convert him into a sort of floating weather-cock, the wings serving as dampers to restrain him from turning too quickly. It therefore appears, if soaring really does depend on the interaction of varying wind-currents, as if the changes of direction involved must be almost automatic, and not a thing which the bird is required to learn; although he may doubtless learn to take advantage of favoring currents by giving proper inclinations to his wings and tail.

If the question be raised as to the sufficiency of the varying intensity of the wind-currents to maintain the bird's initial velocity against the resistance of the air, we must reply that it is a matter which can only be determined conclusively by experiment. Certain it is, however, that in windy weather the wind does come in gusts. If in the course of his circles the bird happens to be travelling at right angles to the wind, when the gust strikes him he will surely be turned round, almost in spite of himself, so as to face the gust. If the bird does face the gust, it will certainly raise him to a higher level.

If this explanation proves to be the true one, the reason why small birds cannot soar is probably, that, in those of them that have suitably shaped wings and bodies, their surfaces are so large in proportion to their weights that they rapidly assume the velocity of the surrounding air. In order that they might soar to advantage, the gusts should come more frequently, and be of shorter duration, than we actually find to occur in nature.

WM. H. PICKERING.

Harvard Observatory, Cambridge, Mass., March 21.

Definition of Manual Training.

I HAVE just seen in your pages (*Science*, xiii. p. 9) the excellent definition of "manual training," given by the New Jersey Council of Education. But the name is already too familiar in various vaguer uses, and especially for training to fit for manual labor: hence there would be great advantage if a fresh name were applied. Would not "manu-mental training" do admirably? It expresses the precise idea in such a way that a mistake as to its meaning is impossible.

J. E. CLARK.

Bootham, York, Eng., March 15.

Curves of Literary Style.

AFTER reading the communication on "Curves of Literary Style," in the last number of *Science*, I counted the words in 300 sentences towards the last of Carlyle's "French Revolution," and found the curve, when plotted, to agree very closely with your correspondent's as published, though there were several longer sentences interspersed, showing that the passages examined were from a different part of the work. This was very satisfactory; but the same method of examination, applied to the first 300 sentences of Carlyle's "Sartor Resartus," gives a very different result, the curve corresponding pretty closely with that given for Johnson's "Rambler." This goes to show, if it does not prove, that for detective purposes the method is valueless. All compound words and phrases connected by hyphens were counted as single words only. The 300 sentences filled 30 out of 200 pages of the edition used.

H. A. PARKER.

Cambridge, Mass., March 25.

The Velocity of Storms as related to the Velocity of the General Atmospheric Movements.

IT has for a long time been maintained by some meteorologists that the chief cause of the progressive movement of storms is that these atmospheric disturbances are carried along by the general movements of the atmosphere, as eddies on the surface of a river are borne along by the current in which they exist. The German meteorologists Van Bebber and Köppen have especially insisted on these views, maintaining that the direction and velocity of storms are determined by the mean motion of the entire atmosphere in which they exist; and Gen. Greely has recently, in the *American Meteorological Journal*, educed the recorded wind-velocities on Mount Washington as favoring this view.

In order to study this and allied questions, the writer began two years ago a systematic series of observations on the clouds. These observations were made hourly between 7 A.M. and 11 P.M. Facilities were not available for obtaining the actual velocities of the clouds, and it was hence necessary to be content with obtaining the apparent velocities. These were obtained by means of a nephoscope devised by the writer. The nephoscope consists of a horizontal mirror held in a frame carrying an eye-piece movable along vertical and horizontal arches, so that the direction of cloud-movements can be determined in degrees of azimuth. To obtain the relative velocity, a movable support is so arranged, that, when the observer's forehead is rested on it, the retina of the eye is maintained at a constant height of seven inches above the surface of the mirror. When the eye is in this position, the number of quarter-inches which the image of a cloud is seen to move across the mirror in a minute is taken as the relative velocity of the cloud. It is evident that the relative velocity of the cloud thus obtained bears a relation to the actual velocity; and, if the height of the cloud be known, its absolute velocity relative to the earth's surface